

SUNFISH NESTS OF BEIMILLER'S COVE.*

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During the night of July 4-5, 1915, a strong southwest wind drove the water of Sandusky Bay out into Lake Erie in such quantities that it receded thirty feet from the shore line in what is known as Beimiller's Cove. This decided drop in the water level brought to my attention some nests of the sunfish, *Eupomotis gibbosus*, which circumstance suggested a study of the conditions under which the fish of this region breed. As is well known many of the fishes of the Great Lakes choose the shallow bays and coves for breeding places. An investigation of these localities is of some importance, since with the present rapid occupation of these shores by man and their consequent alteration, the neighboring waters lose much of their value for breeding purposes. The finding of suitable nesting places must be presenting a greater problem to the fish each year.

The observations recorded in this article have to do with conditions in Beimiller's Cove alone and are therefore not sufficiently extensive to draw conclusions regarding the general situation. And even what has been recorded from this cove is to be looked upon chiefly as a preliminary study. There are some points of interest, however, worth noting. It is hoped that further and more far reaching observations to be undertaken in the future may throw considerable light upon these questions.

Beimiller's Cove is an indentation in the sandy peninsula known as Cedar Point, which stretches across the eastern end of Sandusky Bay from the southeast and separates it from Lake Erie. The cove lies on a line running southeast and northwest and is about half a mile long and one-third of a mile wide. At its inner end there empties a sewage canal. The depth of water varies from less than a foot at the inner end and along the sides to six or eight feet in the center and at the mouth of the cove. The bottom is covered with a luxuriant growth of aquatic plants, such as *Myriophyllum*. Along the shores are reeds, particularly *Scirpus americanus*. The bottom and shores

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toward the inner end are mucky. Water lillies are abundant here. The western shore is thickly covered with reeds, at places there are marsh conditions and nearly everywhere there is a deposit of dead vegetation. Where this vegetation is absent a sandy or pebbly bottom is exposed. The bottom along three-fourths of the eastern shore for a distance of fifteen

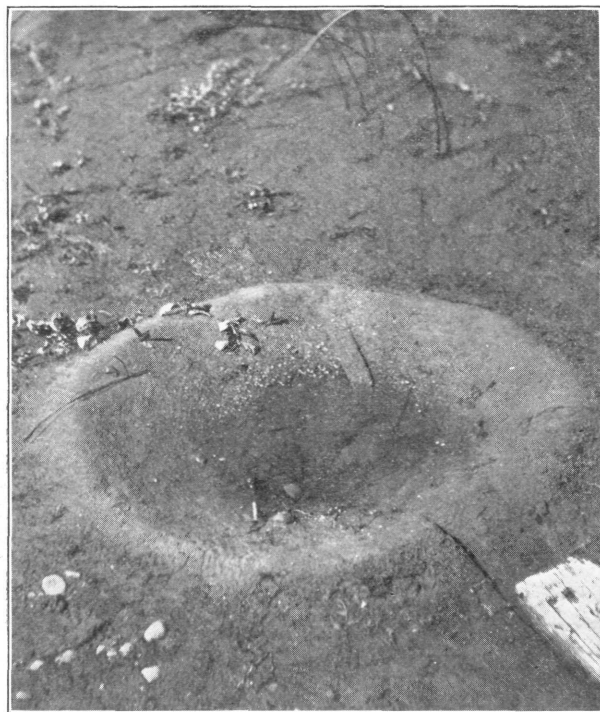


Figure 1. Large nest completely exposed. Some water still covers bottom of nest. Darker spot in center of this marks area within which eggs lie.

to twenty-feet out from the shore line is sandy and pebbly and is sparsely covered with vegetation. The difference between the eastern and the western shore is due partly to the influence of winds and currents which tend to pile up debris on the western side.

The observations on the nests were made at intervals of about a week between July 5 and July 27, 1915. Within this period the total number of nests counted was 419. These

were divided into two distinct types, large nests and small nests. I shall describe the larger type first.

The large nests were found on the sandy stretches of bottom. A good conception of their appearance can be gained from the photographs shown in Figures 1 and 2. They are crater like depressions in the sand at the bottom of which were coarse sand or pebbles and sometimes a large solid object, such as a

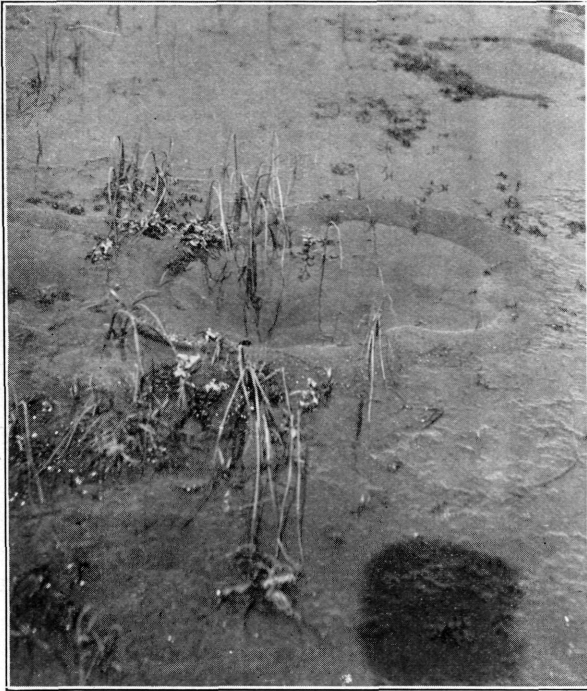


Figure 2. Three large nests exposed on characteristic bottom. Rim of nest in center adjoins that of a nest to the left.

half of a clam shell or a piece of wood that had happened to be buried at the point selected. The depressions were sometimes circular but more often oval. The length of the largest nests measured was thirty-six inches across the top and their width twenty-seven inches. Some of the nests were twenty-five inches by thirty inches and a few were as small as eighteen by twenty inches. The depth of the nests averaged three inches. This, however, depended upon the amount of sand

that had to be scooped out to obtain the proper bottom. The eggs lie in the apex of the depression. They are approximately one millimeter in diameter and they blend so well in color with the sand as to make them rather hard to detect. The large nests were confined to a fairly well defined zone which began about ten feet from the water's edge and extended outward to a line between eighteen and twenty feet from shore. Most of them were in water which was from eleven to fourteen inches deep. A few were in fifteen inches of water.

In describing the location of the nests reference will be made to the outline sketch of the cove shown in Figure 4. The larger rings represent the large nests and the smaller rings indicate the small nests. The letters are for convenience in description and are explained in the text.

On July 5, a group of large nests was found on the eastern side opposite the point A on a sandy bottom with some vegetation. This group lay approximately fifteen feet from shore on the border line of the mucky region at the inner end of the cove. Some of these nests are shown in Figure 3. Between A and the Lake Laboratory landing (L) fifteen other nests were scattered. These were likewise on a sandy bottom and for the most part lay singly. Three of these are to be seen in Figure 2. There were also some large nests near the south side of the landing, but they were not counted at this time.

From July 12 to 16, a survey was made of the whole eastern shore. On this side all the nests were in the strip of sandy and pebbly bottom, previously mentioned, which was only sparsely covered with vegetation and extended for twenty-five to thirty feet from shore. The conditions were in general like those shown in Figure 2. Between the above dates 138 nests were counted from the landing to the point H, a distance of about a hundred and fifty yards. No nests were found beyond H.

By July 27 there were no occupied nests north of the Lake Laboratory landing and most of the nests previously seen south of this were no longer in use. However, there were some fresh nests among the old ones near H and others were now found as far down as S, at which point there are the remains of an old scow. The total number of nests for the region L to S was thirty. Of these eleven were between H and S. From S to M there was a firm, sandy bottom, but there were no nests

here. In the region M there was a mucky bottom. From M to P the bottom was again favorable. About K there were three scattered nests. In the region of N there were sixteen nests. These nests were in eighteen inches of water.

On the western side there was no continuous stretch of open sandy bottom such as was found on the opposite side. The belt of reeds extended out quite a distance, in some spots ten to fifteen and twenty feet, and at these points other aquatic



Figure 3. Group of the nests at A (Fig. 4), bottom becoming mucky.

plants grew from the cove side up to the reed line, thus isolating patches of open bottom.

The survey of the western shore was made between July 12 and 19. In the indentation at D there was a good growth of water lillies, the shores were marshy, the bottom muddy and the water frequently so tainted with sewage as to be greasy. There were no nests here. Along the short stretch *a*, there was a firm, sandy and open bottom. Here seven nests were found. The inlet B had no nests; its character was similar to that of D. The points *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, *k* had a sandy and comparatively open bottom.

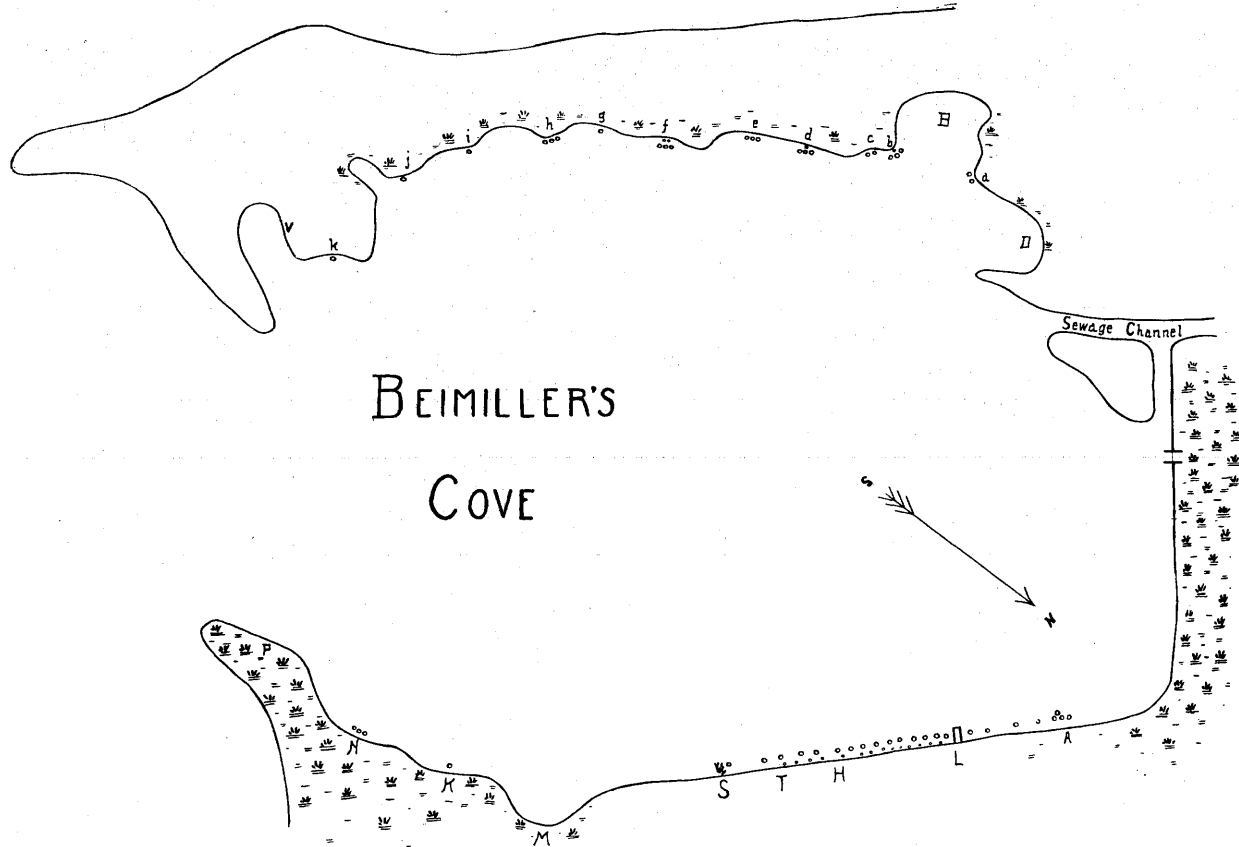


Figure 4. Large rings represent location of large nests, small rings indicate small nests. L is the Lake Laboratory landing. For other points see text.

The following table gives the number of nests at each point:

	LARGE NESTS	SMALL NESTS
a.....	7	
b.....	18	2
c.....	10	
d.....	17	1
e.....	14	
f.....	14	5
g.....	4	
h.....	12	
i.....	3	
j.....	3	
k.....	1	
Total.....	103	8

The nests at *g* were among reeds. At *v* the bottom was clear and sandy and appeared to be ideal for nests but none was found. The total number of large nests, including those on both shores, was 290.

The other type of nests, the small nests, were approximately circular and had an averaged diameter of seven inches. Practically all of them were on the eastern side. With two exceptions they were found at a distance not greater than six feet from the shore, most of them within three or four feet of it. The exceptions were two widely separated nests which were fifteen feet from the shore line. In the zone of more usual occurrence there was a pebbly bottom and a fringe of reeds, largely *Scirpus americanus*. The nests were made on the pebbles among the reeds. A photograph of this type is shown in Figure 5 between the arrows.

The depressions in many cases were so shallow that their outlines could frequently only be determined by the fact that the pebbles had been fanned clean. The roots of reeds were often at one side of a nest but since the reeds grew close together this could not well be avoided. They were never found in more than seven inches of water, barring the exceptions noted, and some were in barely enough water to cover them.

During the period July 12 to 16, 105 of these small nests were found on the eastern shore between the points *L* and *H*. By July 27 they were found as far down as the point *T*. On this date sixteen of them were counted between *H* and *T*. Although I made careful search, I could discover them nowhere else on the eastern side. In the survey of the western shore made from July 12 to 19, only eight small nests were found. Two of them were located at the point *b*, one at *d* and

five at *f*. The total number of small nests, including those on both shores, was 129.

■ In a general consideration of the sunfish nests in the cove several features should be noted. The type of bottom which appears to be most suitable for nest building is one composed of sand, or sand and pebbles, with little or no vegetation. This is borne out by the fact that on the sandy and open bottom of the



Figure 5. Small nest, between the arrows, in a typical location. Photograph taken through the water.

eastern shore there was a total of 308 nests whereas along the more overgrown western shore there were only 111 nests. Also on comparing the eastern with the western shore, it will be seen that in each case the nests were almost exclusively where the bottom was of the character described. On the western side suitable areas were found from *a* to *k* and on the eastern side there was an almost unbroken stretch from *A* to *P*.

However, the character of the bottom does not appear to be the only determining factor in nest location. The stretch

of shore at *v* is apparently as favorable as that along the most of the eastern side, considerably more so than much on the western side, which was occupied, and yet in this stretch there were no nests. There is also a similar strip on the eastern side between S and M, which was unoccupied. In fact, taken as a whole, the eastern side presents more favorable surroundings than does the western side and all the nests on the latter shore could have been accommodated on the opposite one. These circumstances suggest that other factors in addition to the character of the bottom aid in determining the matter of location.

What these other influences are is not yet clear. An element of chance with regard to the shore the fishes follow as they enter the cove may enter into the choice. If anything approximating suitable conditions are found on the shore followed they probably nest without seeking farther.

Another factor which apparently has some bearing is the proximity of other nests. This is to be gathered from the fact that there is very clearly a tendency to build the nests in groups independently of any influence which restricted area may have in this direction. The grouping of nests on the western shore can be credited in part to restricted surroundings. However, on the eastern side where there was plenty of space to permit a wide distribution, there was at certain points a decided grouping. This applies to both types although it was more generally true of the small type. Three or four large nests were frequently found rather close together and in some cases they were so near each other that their rims touched. Two such nests are to be seen in Figure 2. One of the most extensive groups of large nests was found north of the laboratory landing at A. A part of this group is shown in Figure 3. The small nests nearly always occurred in groups. I have a record of only ten solitary small nests. They were frequently placed in triangular groups of three, the members of a group lying as close together as they well could. In other instances there were as many as five or six nests within a short distance of each other. There would then be an interval without nests, although apparently suitable for the purpose, followed by another group.

One other matter of interest with regard to location is the fact, already pointed out, that each type of nest was confined to a distinct zone. This condition was well shown on the

eastern side, where there was a distance of four feet between the two zones. The zone of large nests began ten feet from shore, whereas the small nest zone ended six feet from the water's edge. I have no data at hand that afford an entirely satisfactory explanation of this separation. The position of the small nests along the edge of the water is hardly favorable for the hatching of eggs since the constant fluctuation in water level frequently causes some of the nests to be uncovered. Occasionally they are exposed long enough to destroy the eggs. The fish guarding the small nests were not as large as those on the larger nests and it is possible that they were unequal to the task of forming nests in the deeper sand farther from shore. It is possible also that they sought the shallow water to escape enemies. However, I saw nothing to indicate that they were forced to this location by the larger individuals.

A condition of considerable importance from the standpoint of the cove as a breeding place is that it is being contaminated with sewage. Since an open sandy bottom is apparently such an important factor in nesting conditions its obliteration is certain to have harmful results. To a certain extent the sewage is having this effect. It is being deposited over the inner end of the cove and especially over that part about the mouth of the sewage canal. However the direct effects of the sewage deposit are probably not as great as are its indirect effects. The latter are brought to bear through the fertilizing action of the sewage upon the plants that take possession of the bottom. The growth of the plants in the cove is luxuriant even for a region in which aquatic plants are abundant. The sewage also has a harmful influence through its vitiating effect upon the water. The situation is such that this effect is confined mainly to the western side, and probably as yet, it is no great factor even here, since patches of sand within the contaminated are occupied, as for example at *a*. Nevertheless the results are disastrous where the sewage concentration is great, as it is near the mouth of the canal. Its influence here may be estimated from the fact that some carp kept in a "live box" near the mouth of the canal died; and carp are not usually credited with seeking the purest water. If the sewage continues to be emptied into the cove, as it doubtless will be, a marked influence upon the fish visiting the locality will probably be noticeable within a few years.

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